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Evaluation of Optimum Inclusion Level Azanza Garckeana Pulp on Survival of Clarias Fingerlings

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Abstract
The mortality and survival rate of feeding *Clarias gariepinus* with optimum inclusion of *Azanza garckeana* was studied for 8 weeks. 150 fingerlings of the same size was stocked in fifteen plastic bowls, 30 fingerlings was stocked each in triplicate and aerated throughout the period of experiment. Fish feed of 40% crude protein at 0 % *Azanza garckeana* inclusion (control D_1), 10%(D_2), 15%(D_3), 20%(D_4) and 25%(D_5) inclusions of *Azanza garckeana.*The experiment was monitored for mortality and survival rate with reference to inclusion levels. The results of the experiment showed that, the highest mortality rate observed was in the control D_1 (22). The mortality rates in the other treatments were D_4 (15), D_2 (12), D5(11) and the lowest in D3(5). Percentage survival was highest in D_3 (83.3), followed by D_5 (63.3), D_2 (60), D_4 (50) and lowest in D_1 (26.6) .From the result it could be concluded that 150g(15%) inclusion level of *A. garckeana* would give better survival rate in the culture of *Clarias gariepinus.*
Keywords: *Azanza garckeana,* proximate composition, optimum inclusion, survival rate fingerlings.

1. INTRODUCTION

In Aquaculture, feed constitutes one of the major inputs in intensive and semi intensive fish farming and can reduce the economic viability of a farm if suitable feed are not used. Fish require nutrients for growth, reproduction and other physiological functions like other farm animals (Haruna, 2003). They need mineral, vitamins, growth factors and energy sources.Feed and feed stuff contain nutrients and energy sources essential for growth and reproduction and health (National Research Council (NRC) 1993). The use of commercial pellets is so expensive that it account for about 40% to 60% of the recurrent cost of fish farming venture (Falaye, 1992; De Silva and Anderson, 1995; Sogbesan and Ugwumba, 2008). The financial viability of aquaculture investments is highly dependent on the total price paid for aquafeeds, which generally account for 50–70 percent of production cost. Generally, the impact of increased feed price, as in the case of the recent increase in global food prices, will vary between countries and regions and depend on the trends in species used and levels of intensification of farming systems (Rana, *et al.,* 2009).There is therefore a pressing need to search for alternative cheap feed stuffs from other feed ingredients of plant origin with approximate protein source in other to reduce the cost of feed input in aquaculture, (Madu *et al*, 2003; Sogbesan and Ugwumba, 2007). Fish feed is high and affected by the cost of feed used in formulation of feed (Olumola, 1990). The continuing concerns about the use of fish as feed and the rising prices of fishmeal and fish oil have led to considerable investments in research to find alternative sources of affordable and high-quality plant and animal-based feed ingredients. Fishmeal could be replaced by vegetable protein concentrates, including genetically modified derived feed materials (i.e. soybean meal, rapeseed meal)(FAO**.** 2010).

The major constraint in fish production is feed. Fish feed contribute more than half of the overall cost of a fish culture operation making fish feed the single most expensive item in intensive fish farming (Ayinla, 1991). According to Orwa *et al*,2009, *Azanza garckeana* fruit pulp is edible and have an energy content of 8.10kJ/g. Sweet mucilage comes out when chewed. The fruit may be eaten raw if gathered green and juicy and the pulp is peeled off from the seed. The selection of *Azanza garckeana* fruit as feed stuff ingredient is to add certain percentage inclusion based on desirable characteristics such as chemical composition, relative cheapness, abundance in supply and limited anti-nutritional factors. Interestingly these feed stuffs abound in northeast region of Nigeria and can be used as substantial replacement for the conventional ingredients in fish feeds. The need for possible use of alternative energy source in feed production has long been emphasized, (Adebola, 1977) among one of such substitute is the need to investigate *Azanza garckeana*. Hence, different inclusion levels of plant protein meal with alternative source of protein *Azanza garckeana* could be of considerable economic advantage if the ingredient is in association with moderately reduced feed conversion ratio and thus losing less energy ration protein, metabolism and excretion of nitrogenous waste (Goldstein, 1970 and NRC, 1981). In Nigeria, the tree is found in Gombe State with the name Kola of Tula (Goron Tula). It is common in large quantity during the dry season, when the fruits is dried and eaten by local people. Report from local people; indicate that the fruit enhance fertility, produce energy and growth in human beings (personal Communication

2012). The fruit is abundant and after eating the edible sweet fruit the seeds are thrown away. The objectives of the study are to determine the proximate composition of *Azanza garckeana,* estimate the survival rate of fingerlings fed different inclusion levels of *Azanza garckeana* and identify the optimum inclusion level of *Azanza garckeana* in fish production.

2. MATERIAL AND METHODS

This research was carried out in Modibbo Adama University of Technology Yola at Fisheries laboratory . The experimental site is located within the Guinea Savanna zone and lies between latitude 9^0 and 11^0 North and longitude 11^0 and 14^0 east. Rainfall usually begins in late March and end around October while the dry season starts in late October between 700mm to 1000mm with average minimum temperature of 32^0C and a maximum of 42^0C (Adebayo and Tukur, 1997).

2.1 Processing of *A. garckeana* pulp

The seeds were separated from its pulp and both the pulp was sun dried for easy processing. The pulp was removed from the seeds, grind into powder form and sieved using the 0.1mm mesh size of the sieve. *Azanza garckeana* and formulated diets were analyzed for proximate composition in the laboratory, following the method of Association of official chemist (AOAC, 1995). The moisture, ash, crude protein (CP), ether extract, crude fibre and nitrogen free extract (NFE) of experimental diets was determined.

2.2 Feed Formulation

The feed ingredients used were Fish meal, soya bean meal, groundnut cake (GNC), yellow maize, vitamin premix, salt, binder and bone meal. They inclusion levels of *Azanza garckeana* pulp at 0%, 10%, 15%, 20%, 25%, per 2kg compounded 40% Crude Protein fish feed. Fingerlings (150) were purchased at Federal Ministry of Agriculture Fisheries Jimeta Yola. The fingerlings were transported to the Department of Fisheries laboratory in open plastic jerry cans and acclimatized for one week.

2.3 Experimental Set up, Feeding Rate and Frequency

Fifteen (15) plastic bowls, of 20 litres volume were used. Each treatment was in triplicate and ten (10) fingerlings stocked in each. The bowls were aerated throughout the experiment. The fingerlings were fed 5% body weight daily. Excess feed was siphoned every morning before feeding and the water increased to the preferred volume of 20 litres. The survival rate of fingerlings fed different inclusion levels was determined as follow:

% Survival = Initial number of stocked fish – Final number of fish x 100

3. RESULTS

The proximate and mineral composition analysis of *A. garckeana* (Table 2), the crude protein level of the pulp was 10%. The other components were crude fibre 38.0%, lipid 1.0%, moisture content 26.0%, dry matter 30.0% and the Nitrogen Free Extract (NFE) 29.0%. The mineral composition showed the following results: Zinc (Zn) level 1.050, and others components were Calcium (Ca) 3.340, Magnesium (Mg) 7.620, Sodium (Na) 2.030, Potassium (K) 13.32 and Iron (Fe) 1.40.

Table I: Expermental Feed Showing Rate of Inclusion of *A. garckeana* (PULP)

Ingredients	D_1(g)	D_2 (g)	D_3(g)	D_4 (g)	D_5 (g)
Fish meal (72%)	25	25	25	25	25
Yellow maize	15	15	15	15	15
G.N.C (45%)	26	26	26	26	26
Soya bean meal (40%)	22	22	22	22	22
Vegetable oil	8	8	8	8	8
Vitamin premix	1	1	1	1	1
Sodium chloride	1	1	1	1	1
Oyster shell	1	1	1	1	1
Binder (starch)	1	1	1	1	1
A.garckeana (g/kg feed)	0	50	100	150	250
Percentage inclusion	0	10	15	20	25

Table 2: Proximate and Mineral Composition of *A. garckeana* (Pulp)

Components	Proximate composition
Crude lipid	1.0
Crude fibre	38.0
Crude protein	10.0
Dry matter	30.0
Moisture content	26.0
NFE	29.0
Zinc	1.05
Calcium	3.34
Magnesium	7.62
Sodium	2.03
Iron	1.40
Potassium	3.32

WEEKLY MORTALITY RATE OF FINGERLINGS (*Clarias gariepinus*)

At the eight (8) weeks study the mortality rate of (*Clarias gariepinus*) fingerlings was recorded (Table 3). In the control (D_1) there was mortality from the first to sixth week while there was none in the seventh week but eighth week. The total mortality in (D_1) was 22 fingerlings. In (D_2), a total of 12 mortality were recorded.In (D_3), had a total of 5 mortalities D_4 15 mortalities and D_5 11.

Table 3: Weekly mortality of fingerlings in eight weeks.

Diets	Initial stocking	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Total mortality
D_1	30	4	3	3	3	1	7	_	1	22
D_2	30	4	1	2	_	_	1	4	_	12
D_3	30	3	_	_	_	1	1	_	_	5
D_4	30	3	1	1	_	1	7	1	1	15
D_5	30	2	2	2	2	_	2	1	_	11

The survival rate of the fingerlings at the end of eight (8) weeks of the research (Table 4) showed that D_1 was 8 , D_2 18, D_3 25, D_4 15 and D_5 19 fingerlings respectively. The percentage survival of the fingerlings at the end of eight weeks were D_1 26.6, D_2 60, D_3 83.3, D_4 50 and D_5 63.3.

Table 4: Weekly Percentage of Survival of Fingerlings at the End of Eight Weeks

Parameters	D_1	D_2	D_3	D_4	D_5
Initial stocking of fingerlings per tank	30	30	30	30	30
Final survival rate	8	18	25	15	19
Percentage survival (%)	26.6	60	83.3	50	63.3

The mean rate of survival and mortality of fingerlings (Table 5) showed the following: D_1 2.66% and others (D_2) 6.00%, (D_3) 8.33%, (D_4) 5.00% and (D_5) 6.33%. The result of survival rate showed that treatment (D_3) had highest survival rate, followed by (D_5) and the lowest was in (D_1) 2.66%. There were significant differences in the rate of mortality and survival among the different treatments.

Table 5: Mean Survival and Mortality Rate of Fingerlings Fed Different Inclusion Levels of *A. Garckeana* (PULP)

Parameters	D_1	D_2	D_3	D_4	D_5	SEM
Mortality rate	7.33^{a}	4.00^{b}	1.66^{c}	5.00^{b}	3.66^{bc}	0.68**
Survival rate	2.66^{c}	6.00^{b}	8.33^{a}	5.00^{b}	6.33^{ab}	0.68**

Means with different superscripts on the same row are significantly different ($p<0.05$).

4. DISCUSSION

The proximate composition of *A.garckeana* used in this experiment showed the percentage of dry matter and fibre were different from the result of Orwa *et al.,* 2009. The crude protein was 10%, this result did not agree with Orwa *et al.*, 2009 that recorded 12%. However the level of lipid was the same the result of the authors. According to Mojeremane and Tshwenyane 2004, *A. garckeana* had importance in mineral such as phosphorus, sodium, magnesium, and calcium. The minerals except phosphorus were also found in *A. garckeana* used in the experiment. Iron and potassium were also obtained in *A. garckeana* used as was reported by Orwa *et al,* 2009. Zinc was not identified in the work of Orwa *et al.,* 2009 and Mojerenane and Tshwenyane 2004.

The result obtained in *A. garckeana* agreed with Saka el al 1994 who stated that indigenous fruit trees provided vitamins and minerals for proper growth and maintenance of human health. The difference might be attributed to different environmental condition such as harvesting time, soil type, weather and even processing

method.

A. garckeana is an indigenous fruits tree species that is found in Gombe State with the name kola of Tula (Goron Tula); in large quantity during dry season have agreed with; Taylor and Kwerepe, 1995; Taylor el al, 1996. This stated that *A. garckeana* is the only indigenous fruit tree species that is semi-domesticated by local people in Botswana which grows in their homesteads and crop field (Mojeremane, 1999).

The research had agreed with (Kwesiga and Mwanza, 1995; Taylor al el; 1996) that reported that the fruit *A. garckeana* is indication that the species is simple and occasionally exploited tree of the wild vegetable but has an economic importance to farmers in African markets.

The report of mortality rate in diet D_1 had the highest mortality rate of 22(73%) , followed by D_4 15(50%), D_2 12(40%), D_5 11(36.6%) and D_3 5(16.6%). The mortality observed in the experiment might not be attributed to the feed components especially *A. garckeana* pulp but more to environment. The epileptic electricity supply during the research affected the fingerlings since the culture systems were not aerated for many weeks.

The table shows the survival rate of fishes fed in the experimental diets. Fish on diet 5 had high survival rate of 63.3% followed by diet 2 and 4 with survival rate of 60% and50% respectively while diet 3 had the highest survival of 83.3%. If the problem of electricity were not a limiting factor, the survival rate would have been higher.

5. Conclusion

From the results obtained, the best optimum inclusion level of *A. garckeana* in different diets was diet 3 (150g) which had the highest survival of the fish followed by diet 5(250g) and diet 2(100g). In conclusion *A. garckeana* is a potential feed ingredient that can enhance the survival of fingerlings at 15% inclusion.

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